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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/779,864

02/18/2004

Edwin Eduard Nicolaas Josephus Krijnen

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06/01/2006

PILLSBURY WINTHROP SHAW PITTMAN, LLP
P.O. BOX 10500
MCLEAN, VA 22102

EXAMINER

ANDERSON, DENISE BROWN

ART UNIT

PAPER NUMBER

2877

DATE MAILED: 06/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/779,864

Applicant(s)

KRIJNEN, EDWIN EDUARD
NICOLAAS JOSEPHUS

Examiner

Denise B. Anderson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>2/18/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

Figures 1a and 1b should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The drawings are objected to because the following minor informalities: the reference numerals of the drawings appear to be written instead of typed. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application

must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The abstract of the disclosure is objected to because the length of the abstract exceeds the required 150-word limit set according to rule 37 CFR 1.72 (a) & (b). Correction is required. See MPEP § 608.01(b). The abstract is further objected to because it contains legal phraseology. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

Claim Objections

Claims 1, 2, and 7 are objected to because of the following informalities: the claims are written in a way that makes it unclear as to the location of the object with respect to the other components of the apparatus. Appropriate correction is required.

Claims 1, 8, 21, and 23 are objected to because of the following informalities: use of the phrase "normal reference" makes the claim confusing with respect to the reference laser beam. Examiner suggests rewording in a similar manner: change "a normal reference makes" to "a normal to the mirror surface makes". Appropriate correction is required.

Claims 2, 7, 8, 20, and 23 are objected to because of the following informalities: the phrase "the normal to which makes" is ambiguous. Examiner suggests changing to "the normal to the mirror surface making" or a similar change that makes it clear that applicant is referring to the normal to the mirror surface. Appropriate correction is required.

Claim 15 is objected to because of the following informalities: there is insufficient antecedent basis for the phrase "said optical signal". Examiner suggests changing "said optical signal" to "said interference signal", as this is what examiner has interpreted applicant to mean. Appropriate correction is required.

Claim 23 is objected to because of the following informalities: there is insufficient antecedent basis for the phrase "said lithographic apparatus". Examiner suggests deleting the words "to said lithographic apparatus". Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 6-10, and 14-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takai et al (USPN 6,819,433).

As to claims 1 and 2, Takai et al disclose providing a reference laser beam (column 9, line 57); providing a measuring laser beam (column 9, line 57); reference and measuring laser beams are provided by Z-measuring interferometer 25 in figure 2 shown below; the measuring laser beam is directed substantially perpendicularly incident (column 14, lines 56-59) on a measuring mirror with a fixed position relative to an object (z-measuring mirror 30 is fixed to the top stage 27, which holds the wafer chuck/object as described in column 6, lines 38-43 and column 7, lines 55-59); the normal to the z-measuring mirror 21 may also make a non-zero acute angle with the z-direction (see lines extending from the mirror, as drawn by the examiner and the explanation in column 7, lines 22-27); partly overlapping the reference and measuring beams creates an interference signal by definition; determining a change in the interference signal (column 7, lines 45-54); processing the change to determine displacement of the object along the z-direction (column 7, line 60 thru column 8, line 2).

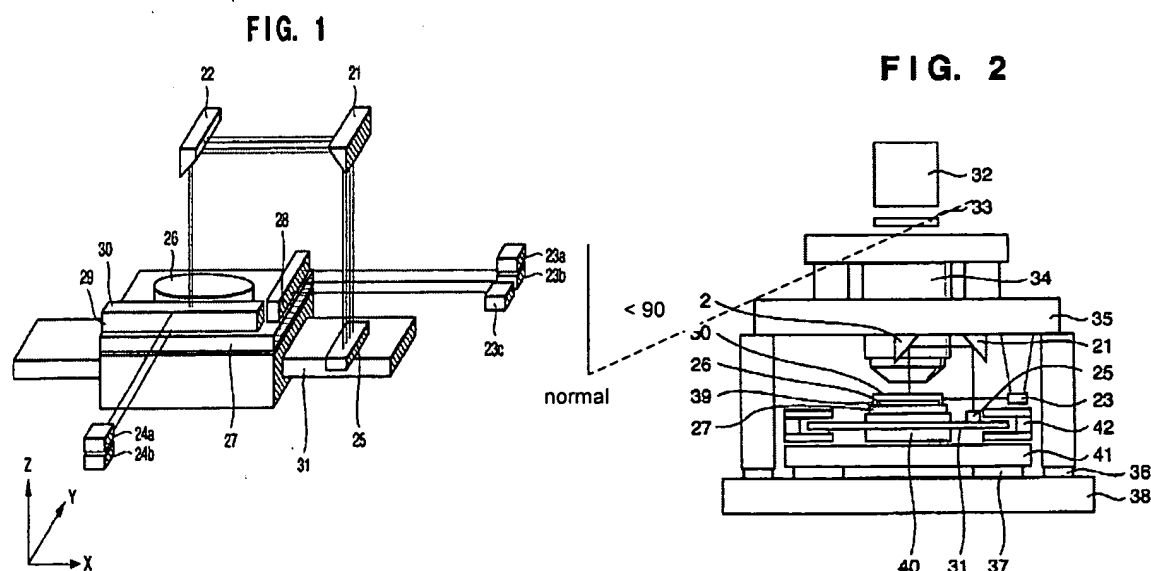
As to claim 7, Takai et al disclose, in figures 1 and 2, the features as described above for claims 2 and 3. In addition, Takai et al disclose a set of 2 mirrors – one

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measuring mirror and a separate mirror fixed with respect to the apparatus. See figure 2, mirrors 21, 22 and 30 (mirror 30 being fixed to top stage 27, on which the wafer chuck resides).

As to claims 8 and 20, Takai et al disclose, in figures 1 and 2, the same features as already described in claims 1, 2, and 7 above and in addition, a projection system 34, a movable holder configured to hold the object (top stage 27 holds wafer chuck 26).

As to claims 21 and 23, Takai et al disclose, in figures 1 and 2, the same features as already described in claims 1, 2, 7-8 and 20 above and in addition, illuminating the object with a beam of radiation having an optical axis in the z-direction (illumination system 32, illuminates a wafer on stage 27 in the z-direction, as shown by the coordinate system in figure 1); and moving the object during illumination (column 8, lines 55-65).



As to claims 1,2, 7-8, 20-21 and 23, Takai et al does not expressly disclose that the measuring beam is retro-reflected. However, by definition of a retroreflector as "a device that sends light or other radiation back where it came from regardless of the angle of incidence, unlike a mirror, which does that only if the mirror is exactly perpendicular to the light beam" (<http://en.wikipedia.org/wiki/Retroreflector>) it can be inferred that the z-measuring mirrors 21 or 30 shown in figure 2, because the light is perpendicularly incident (column 14, lines 56-59) on the mirror, retro-reflects the measuring beam. It would have been obvious to one of ordinary skill in the art at the time of the invention to retro-reflect the measuring beam of Takai et al for the purpose of creating a beam that retraces its path in the opposite direction, as defined above for a retro-reflector.

As to claims 6, and 14-15, Takai et al disclose determining at least one additional displacement measurement to use with the calculation of the displacement of the object in the z-direction (column 7, line 64 thru column 8, line 15).

As to claims 9 and 10, Takai et al disclose, as interpreted by the examiner, the holder mover (top stage 27 which holds wafer chuck 26 in figures 1 and 2) is operatively connected to and controlled by the interferometer system 25 (column 6, lines 48-52 explain that the interferometer system is used for measuring the position and displacement of the top stage).

As to claims 16 and 17, Takai et al disclose additional measuring and reference beams (column 9, line 57) and shows the beams are parallel in figure 3 (see beams directed from interferometers 25a and 25b).

As to claims 18 and 19, Takai et al disclose, in figure 3, additional measuring mirrors, 21, 22, with acute angles with respect to the z-direction (see also the normal drawn in figure 2 above). The two mirrors 21, 22 are on opposite sides of the holder as shown in figure 3.

As to claims 22 and 24, Takai et al disclose, in figure 3, light beams from interferometers 25a, 25b that are outside of the object in the object holder (i.e., outside of the wafer in the wafer chuck mounted onto top stage 27).

Claims 3-4 and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takai et al (USPN 6,819,433) and further in view of Osanai et al (USPN 6,285,444).

As to claims 3-4 and 11-12, Takai et al disclose a Z-measurement system using a Z-measuring mirror with an acute angle (column 2, lines 10-21 and column 7, lines 15-20). Takai et al does not expressly disclose the specifics of the acute angle. Osanai et al disclose an angle of 45 degrees for the measuring mirror (31b in figure 3) and states that the acute angle is advantageous for providing a measurement in the z-direction (column 10, lines 48-55; column 15, lines 33-42; and column 24, lines 55-61). It would have been obvious to one of ordinary skill in the art at the time of the invention to use an angle of 45 degrees or other acute angle as described by Osanai et al with the z-measuring mirror of Takai et al for the purpose of measuring in the z-direction or for avoiding mechanical interference as described by Osanai et al in column 24, lines 55-62. Furthermore, It would have been obvious to one of ordinary skill in the art at the time of the invention to experimentally determine the acute angle for providing the most

sensitivity in the z-direction since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 5 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takai et al (USPN 6,819,433) and further in view of Van Den Brink (USPN 5,801,832).

As to claims 5 and 13, Takai et al disclose, in figures 1 and 2 above, the Z-measuring mirror and the radiation in the z-direction. Takai et al does not expressly disclose the distance between the points where the optical radiation in the z-direction intersects the substrate and the light from the z-measuring mirror. Van Den Brink discloses, in figure 7 and in column 16, lines 29-48, that this distance need to be essentially zero (i.e., "at the point where the optical axis...of the projection system intersects the substrate surface"). Zero is less than 6 mm. It would have been obvious to one of ordinary skill in the art at the time of the invention to make the prescribed distance zero as described by Van Den Brink with the apparatus of Takai et al for the purpose of determining the exact position of the substrate as described by Van Den Brink in column 16, lines 36-42).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Loopstra et al (USPN 6,020,964) discloses a z-measuring apparatus with an acute angled measurement mirror.

Fax/Telephone Information

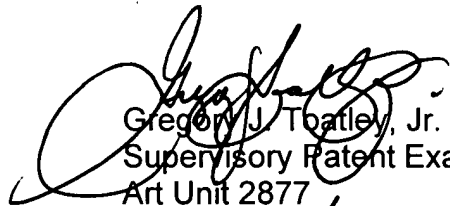
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Denise B. Anderson whose telephone number is 571-272-8324. The examiner can normally be reached on Mon-Fri (9:30 AM - 6 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley Jr. can be reached on 571-272-2800 ext. 77. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Denise B. Anderson, Ph.D.
Patent Examiner
Art Unit 2877

DBA 
Date Signed: 5/22/06


Gregory J. Toatley, Jr.
Supervisory Patent Examiner
Art Unit 2877
5/24/06